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Source: *Annual Review of Anthropology*, Vol. 3 (1974), pp. 279-299

Published by: [Annual Reviews](#)

Stable URL: <http://www.jstor.org/stable/2949292>

Accessed: 18/10/2014 19:20

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SOCIAL NETWORKS

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The idea of the social network is becoming increasingly popular among both social anthropologists and sociologists as one way of understanding behavior, particularly in larger scale complex (less structured) societies. In the last 5 years several general synopses and summaries attempting to explain social networks have appeared (2, 8, 12, 17, 39, 52). My own contribution (39) and those of Aronson (2) and Boissevain (12) are introductions to special collections of essays using the "network" approach. They are necessarily rather compact and short. Bott's (17) reconsideration of the development of the idea since the first edition of her book in 1957 is useful since it sets the record straight on a number of points which have arisen subsequent to her pioneering study. Naturally, she concentrates particularly on the relationship between social networks and conjugal role behavior. The papers by Barnes (8) and by Whitten & Wolfe (52) are the most effective treatments of the subject. Both contain extensive bibliographies of the most important contributions up to the time of publication. In this review I shall not try to reproduce the bibliographies or the main points made in these papers but rather will concentrate on developments that have taken place since then and on issues on which there are divisions of opinion.

Since the notion of "social networks" was first introduced by Barnes in 1954 (5), perhaps its most striking characteristic has been that it has stimulated much more development and elaboration of the idea itself than empirical field work based upon the idea (cf 53, p. 228). This has led to a proliferation of concepts and terms. Barnes (8, p. 3) comments: "Because the concept has recently become fashionable, the terminological confusion has greatly increased. The terminological jungle, in which any newcomer may plant a tree, is evidence for the basic simplicity of the idea of a network." An effective defoliant for this untoward undergrowth is, of course, the utility of the terms and concepts to which they refer for representing regularities in field data which might otherwise escape attention. There is increasing evidence that we are now beginning to reach this stage in the use of the idea of the social networks. Although several important studies have recently appeared, based on studies in which the idea of the social network has been used (some of them are noted below), it appears that there are many more as

yet unpublished which will soon become available and lead to a much more realistic appraisal of the utility of the idea than has been apparent so far.

This process of conceptual elaboration was set in motion by Barnes's paper in 1954 in which, as is generally conceded, the notion of the social network was raised from a metaphorical to a conceptual statement about social relationships in social situations. The metaphorical use of the idea of the social network emphasizes that the social links of individuals in any given society ramify through that society. The analytical use of the idea of social network seeks to specify how this ramification influences the behavior of the people involved in the network. The focus of interest in analytical uses of the idea of social networks has been in setting up propositions about the way in which what occurs in pairs of "knots" influences what happens in adjacent "knots." For example, in one of the earliest studies in the field, Bott postulated that the division of domestic tasks between spouses was directly affected by the extent to which the people with whom they were linked were connected with one another. Here the behavior of the spouses is related not to the behavior of others towards them directly, but rather indirectly through relationships, as it were, at one stage removed.

In fact, the earliest field reports making use of the notion of social networks, such as those of Barnes (5), Bott (16), and Philip Mayer (38), provided insufficient field data about the nature of the social networks themselves to allow the findings reported in the studies to be checked. These studies, representing as they do the beginnings of the analytical use of social networks, were perhaps presented in this way both because the writers hit upon the utility of the nature of a social network *after* they had collected their field data and because at the time of writing the panoply of concepts and indices which are available to the anthropologist today simply had not been developed.

Some authors who chose to present their analyses in terms of social networks did so because of their discomfort with the structural mode of analysis prevalent at the time. Barnes's paper on class and committees on the Norwegian island he studied was distinctly of this sort. The demands of the field situation had forced the notion of the social network on him in order to take up the slack between a structural frame of analysis on the one hand and his field observations on the other. It is worth noting that all those who made significant contributions to the idea of social networks had worked in large scale social situations: Barnes and Bott had worked in Western European communities, Adrian Mayer (37) had worked in a modern Indian political context, and Philip Mayer (38) had worked among Africans in a South African town. An analysis in terms of social networks, as Whitten & Wolfe correctly point out (52), could just as well be made in the traditional context of anthropological studies, that is, in small-scale tightly organized societies. In fact, so far the frameworks of studies in these situations seem to have been adequate, and people who have worked in them do not seem to have found it necessary to resort to the propositions that derive from social networks.

In retrospect it seems that Barnes's paper (5) and Bott's book (16) provided the stimulus to a number of studies directed towards social networks which proceeded

independently of one another for some years. For example, it is apparent that in the early 1960s both Whitten & Wolfe (52) in the United States were independently exploring aspects of social networks similar to those that a group of us were examining in Central Africa. Many of the ideas set out by Wolfe (53) and published in 1970 were very similar to those I had developed in 1966 and 1967 in Central Africa, which were incorporated into the introduction to a symposium of network studies published in 1969 (39). Yet we had only become aware of our mutual interests in this field in 1969. The need for certain concepts and notions, given the initial idea of the social network, provided, I imagine, the stimulus for the development of similar ideas. In the same way, the general resume of social networks by Whitten & Wolfe (52), written in 1968 but only just published, was prepared quite independently of my own introduction. Yet it covers a large number of similar points although it is inevitable that viewpoints differ somewhat. With the publication in the last year of a resume by Barnes and one by Whitten & Wolfe (52), the position is rapidly becoming clarified and central issues are beginning to emerge.

THE QUESTION OF NETWORK THEORY

One such issue must of necessity be the relationship between the notion of social networks and general social anthropological theory. In its most extreme form the question is whether the use of social networks implies an innovation in theory. In short, is there a network theory? Several writers on social networks have noted that the idea became popular partly as a reaction by anthropologists who were working in complex societies against the overformalization of the structural-functional approach originally developed in small-scale societies. These field workers found that they could not present their findings adequately within the framework of a typical compact institutional analysis characteristic of the structural approach. Instead they sought concepts and a framework which could reflect what they saw as the relatively unstructured quality of social relationships in large-scale societies, or in other words, which could reflect what Firth referred to as the optative element in social relationships. Whitten & Wolfe (52) argue that there were several manifestations of this dissatisfaction with structural theories. These may be classified as two main types. In the first we may classify those theorists who saw the solution to the inadequacy of structural theories in modifying the existing concepts like role and role relationships. Whitten and Wolfe put Robert Merton's and S. F. Nadel's restatement of structural propositions in this category. The second manifestation was the appearance of a number of different approaches, all of which were concerned with the behavior of individuals vis-à-vis one another and which we might classify as "transactional theorists." There were several different types of transactional theorists. Some like G. M. Forster and Eric Wolf emphasized dyadic, patron-client, and brokerage relationships. Others like Thibaut and Kelly or Homans and Blau developed social exchange approaches, while a third group, called action theorists, were concerned with the way in which

individuals manipulated their social relationships so as to be able to achieve certain ends; Barth, Bailey, Boissevain, Nicholas, and Adrian Mayer provide examples of this approach.

Be this as it may, disquiet with extreme structuralist formulations of social behavior may have provided a necessary condition for the development of network approaches, but it was not a sufficient condition, for the majority of the theorists quoted by Whitten and Wolfe formulated their ideas initially without the benefit of concepts derived from social networks. The notion of social networks, therefore, supplements rather than supplants approaches which seek to circumvent the inadequacies of structural approaches; the notion itself does not compete with or replace these different approaches.

Some authors have written loosely about "network theory" as if the propositions about social networks constitute a tight, logically related set of notions which may be used deductively to analyze field material relating to social interaction. Some recent writers like Barnes (8) take strong exception to this point of view, arguing that "there is no such thing as a theory of social networks; perhaps there will never be." Barnes argues that the basic idea behind network analysis is that the "configuration of cross-cutting interpersonal bonds is in some unspecified way causally connected with the actions of these persons and with the social institutions of their society" (8, p. 2). He argues that this is a basic idea and nothing more, and it is what Homans calls an "orienting statement" rather than a theory with propositions that can be tested. He concurs with Bott, who says "there is nothing revolutionary about the idea of social network. It is the sort of concept that can be used in many conceptual frames of reference" (17, p. 330).

Kapferer takes much the same point of view. He argues that the notion of social network is simply a technique of data collection and analysis and that the disappointing results from network analysis can be attributed to an undue concern with classification and definition, with too little concern for the basic theoretical assumptions that underlie it (33, p. 167). Kapferer himself advocates exchange theory as the most suitable basis for network analysis.

Wolfe (53) writes of network theory in one of his papers, yet in the section so headed he does not attempt to formulate a set of interconnected propositions which might be called a theory. In fact, in a later paper written with Whitten, Wolfe states quite categorically that: "It is with exchange and action theory that we find the theoretical basis for network analysis" (52), and these writers comment: "without exchange theory the notion of network would appear quite abstract, divorced from the realities of human life, in specific social and cultural settings" (52). Although Wolfe and Whitten acknowledge that role theory may possibly provide the basis upon which propositions may be set up in terms of networks, they themselves do not attempt to do this. Lawrence Crissman, in an important paper which is not widely available, also casts doubt on the existence of a network theory but argues that network concepts must be made to accord with role theory and the definitions of various kinds of groups. "This necessity arises," he continues "from the fact that to be useful any 'theory' of networks must fill the gap between individuals, who can be studied in terms of roles, and groups, for

which a body of theory and techniques exist" (20, p. 76). Expanding this point, he argues that social networks consist of an inventory of roles which individuals have built up over time and that the network can and should be analyzed in terms of these roles (20, p. 80). But he nevertheless maintains that network concepts provide a useful elaboration of role theory, particularly in situations, as he puts it, as a set of tools "to study those areas of society in which there are no groups."

Chrisman (19), in his study of Danish-Americans in an American town, argues that institutions provide the recruitment area for social networks. Several roles may thus coexist in one network link so that operationally the emphasis must be placed on the institutional settings in which people extend their network links. By concentrating on these he tends also to give prominence to role theory as the basis of network theory.

In fact, there is no writer among those using social networks to analyze field data who does postulate a formal network theory. Those who use the phrase "network theory" usually imply by this nothing more than the set of notions used in network analysis, as Noble (43) does, for example, or else they are simply postulating certain connections between behavior on the one hand and the characteristic, both morphological and interactional, of the social networks of the people concerned.

My own view on the subject is that the debate is more about words than reality. There is no network theory in the sense of "basic assumptions together with a set of derived propositions which are interlinked and capable of being tested" (33, p. 84). But I suspect that there are few theories in social anthropology of this kind at all. That propositions may be derived from a consideration of the characteristics of social networks is, I think, evident.

A proposition derived from network notions—that is, multistranded relationships are more likely to be intense than single stranded relationships—has already generated both confirmatory and contradictory empirical findings. Intensity is taken here to be the extent to which individuals linked by some network relationship are prepared to honor obligations stemming from it, or conversely feel free to exercise the rights implied by that relationship (see 39, p. 27). The rationale for the proposition in common-sense terms is that if people are tied to one another by a variety of different links, then they will find it difficult to sever social relationships and therefore are obliged to carry out the expectations and obligations entailed in those relationships. The material supporting the proposition comes from Wheeldon's study of the way in which a leader in a voluntary society forced his rivals to toe the line by persuading intermediaries, to whom he was linked in different ways and who in turn were linked to the target person in different ways, to bring pressure upon them to withdraw their opposition (46).

Jacobson (29), however, quotes Bailey's material on Pan Untouchables in Bisipara as contrary evidence. The Pan Untouchables did not use the multiplex links they had with their clean-caste co-residents in order to bring pressure on them to accede to their demands. Instead they employed the sanctions of the modern Indian legal system. Jacobson reviews some evidence from accounts of the breakup of villages and other small-scale communities and argues on this evidence that:

'these examples suggest that multiplex relations may appear to enhance control not because of the many-strandedness or the diffuseness of the relationship but because they occur in situations where there is little alternative but to abide by the rules, where it is difficult to escape or avoid sanctions, and where accountability is forced, by circumstances, upon those in the system. The social consequences of multiplex relations ought to be differentiated from those of encapsulation, which also occurs in uniplex relations (29, p. 24).

The difference between the situation analyzed by Wheeldon and the situation described by Jacobson is that in the situation described by Jacobson one of the parties holds power over the other, whereas in the situation described by Wheeldon this was not so. The proposition connecting multiplexity with intensity, therefore, in the light of the points raised by Jacobson, needs to be modified by defining the context as one in which power relations are relatively balanced.

The propositions about behavior couched in terms of concepts derived from social networks, may well have their rationale in common-sense knowledge rather than sophisticated theoretical formulations. But the concepts themselves such as reachability, density, multiplexity and intensity, for example, have their roots in presuppositions about the relationships between social links and behavior. These presuppositions although they may at present be largely implicit, nevertheless may with further systematization and development, become accepted as "theory." The problem about network theory is not whether there is such a thing but how explicit and consistent are the theoretical ideas behind analyses of behavior using social networks.

My own feeling, stated elsewhere (41), is that a good deal of confusion has arisen from the fallacious assumption that all analyses are necessarily cast at the same level of abstraction. Network analyses, at least at present, are necessarily conducted at a fairly low level of abstraction, but institutional analyses are cast at a much higher level of abstraction. Institutional and structural analyses are based upon abstractions from multiplex sets of social relationships in which a plurality of individuals is involved. A network based upon one analytically identifiable content of a multiplex relationship, according to Barnes, may be called a partial network. The classical concept of role is germane to partial networks relating to the normative expectations. Roles in turn may be integrated into institutions by connecting them logically one to another. I would argue that there is no real opposition between analyses conducted in terms of social networks and those conducted in terms of exchange or institutional assumptions. They are merely analyses at a different level of abstraction and therefore deal with essentially different problems.

STRUCTURAL AND TRANSACTIONAL PERSPECTIVES

At present it would be difficult to try to argue that the various writers who have reported field data in terms of concepts derived from social networks are operating either with a consistent set of theoretical ideas or even with a consistent set of concepts. Banck (4) has suggested that as a broad generalization social networks

have been used so far in two different ways. In one approach the behavior of an actor is interpreted in the light of the pattern of links, both interactional and morphological, in his social network. In these studies the explicandum, the thing to be explained, is the behavior, while the explanans, the thing that provides the explanation, is the social network. He contends these studies are based on interaction theory, and that they have been concerned particularly with the establishment of normative consensus and the definition of status. It is, he says, more or less an offshoot of the Durkheimian quest for solidarity and consensus. In the other approach the behavior of the actor is seen in terms of the way in which he manipulates the links he has in order to achieve some end. Here the social network is the explicandum and the ends of the actors are the explanans. These studies, he contends, have been concerned mainly with the organization of political action and are closely linked with exchange theory and games theory. There is some validity in this distinction but it is nevertheless clear that some who use network approaches tend to see transactions, for example, as a consequence of network structure and do not see the network structure necessarily as flowing from the transactions.

At present, judging from the papers I have been able to consult, the transactionalists predominate among those using network approaches to report field data, some treating the network structure as primary and some treating it as derivative. All simplifying classifications are procrustean beds, and some authors whose works are mentioned here will more than likely feel that their analyses have been unduly distorted to fit into the adumbration I present. Nevertheless, I present it in the hope that it will help those who may be contemplating using social network approaches to report field data to focus their theory-generating attention upon problems that need further consideration.

The earlier writers making use of social network approaches appear to have been working mainly within the framework of structural-functionalism. This may seem to contradict my earlier contention (39, 41) that the interest in social networks grew out of the dissatisfaction with structural-functional analyses. But the point I am trying to make is that social networks at this stage were seen as an elaboration of basic structural-functional notions which could provide an explanation of how norm consensus and norm directed behavior was achieved—points which were inadequately handled in structural-functional treatments (see Aronson 3). Barnes, in his paper (5) on class and status in Bremnes, for example, adopted this approach, as did Bott (16) in her pioneering study of London families. Philip Mayer (38) analyzes the way in which a particular category of African migrants in a South African town maintained very close-knit social networks and how this pattern of social relationships ensured their strict adherence to rural home-oriented loyalties. A contrasting group with loose-knit networks participated in a wider diversity of urban-based institutions and tended to lose their rural oriented loyalties. Epstein's (22) study of the creation, establishment, and diffusion of norms in an African city and his (23) study of gossip similarly treated the network structure as the independent variable and the establishment of norms as the dependent variable. This is also the approach Han-

nerz (26) adopts in an unfortunately neglected paper which predates Epstein's but in which the flow of gossip along social networks is analyzed against the ethnography of an inner city lower class Negro neighborhood in Washington, D. C. Boissevain's (13) comparison adopts a structural rather than a structural-functional approach, since he sets out to explain the behavior of the two persons and their wives at the centers of the network primarily through recourse to the structure of the networks of the persons involved. He is only indirectly concerned with the classical functionalist problem of norm consensus and the control of deviant behavior, but primarily is trying to spell out the interconnections among environment (both physical and social), behavior, personality, and the social network.

More recent writers using the network approach have tended on the whole to base their arguments on a transactional model. This was initiated by A. Mayer's study of a local election in India (37). Mayer analyzed the way in which the candidate mobilized support for his candidacy through a variety of one, two, and three step links, the transactional element being represented by the promises of favors and services in return for support of his candidacy. But from the point of view of network analysis, the essential proposition in Mayer's paper is that the candidate who is able to reach the same potential voter through several network paths is more likely to win support than one who has only single paths. In the end the behavior is seen as a consequence of the structural characteristic of the network.

The potential significance of social networks struck Whitten (49) while he was involved in participant observation in Ecuador in 1963. At this time Barnes's paper (5) had been published for some 9 years and Bott's book (16) for 6 years. There is no evidence that Whitten was aware of these works at the time. Adrian Mayer's paper was published after Whitten had completed his fieldwork and after he had published his first account in which the network notion was apparent. At this time Whitten became interested in the transactional aspects of social network, the significance of which had been impressed upon him in Ecuador. By the time Adrian Mayer's paper had been published, Whitten was starting on his study of Negroes in Nova Scotia in which he was able to use a similar approach. The significance of social mobility in Ecuador—and its virtual impossibility in Nova Scotia—had led Whitten to look at ways in which personal investments (social capital) could be used for economic advantage and therefore to the way in which particular links in a social network may be activated by some anchor person for his particular purpose. This has led to a number of studies of the ways in which actors utilize personal links to achieve particular ends (28, 47–49, 51). It is clear that Whitten has developed a transactional approach in social networks which has much in common with a number of other writers. But Whitten has not presented his material in terms of formal network concepts, but rather in the form of "situational analyses." His experience in trying to follow a more formal approach was not encouraging (50).

Several of the contributors to the book I edited in 1969 (40) adopted a transactional approach, e. g. Boswell (15), Wheeldon (46), Kapferer (31), Harries-Jones

(27), and in all of them two features of the transactional approach are apparent. First the basis of selecting the particular person in the network is examined. For the purpose, some specified actor has in mind that certain of the wide range of contacts he has are of more relevance than others. The particular people who are activated by the anchor person are chosen on some principle which the analyst seeks to elucidate. Having thus determined the units or elements in the network, the analyst, utilizing a network approach, must now proceed to explain how the action is influenced by the particular concatenation of people chosen. It is here that the concepts developed in connection with social networks become relevant. The network analyst examines the influence of the "close-knit" nature of the relationships, and the multiplexity, directedness, and intensity of the links on the transactions in which the actors are involved.

The approach of Kapferer, who has published several papers making use of the notion of social networks (31-33), is marked by an explicit and articulate development of the type of exchange theory developed by Blau. In each of the three situations that Kapferer examines—the ostracism of a rate-buster in the electrolytic plant in an African mine, the allocation of conjugal roles of two urban African married couples, and the events that led up to a strike in an African clothing manufacturing establishment—he makes use of basic propositions derived from Blauian exchange theory, but these propositions are related to the social action that ensues by specific and detailed references to the sets of network relationships that existed among the protagonists in the events. One of the striking characteristics of Kapferer's analyses has been the detailed and systematic way in which the network material has been presented. This has allowed him to state many of his propositions in terms of basic network concepts such as density, span, multiplexity, and so on.

Gulliver (25) has applied network notions in a classical anthropological context to the examination of corporate behavior of kinsmen among the Ndendeuli of Tanzania. Several of the contributors to a recent symposium on network approaches (14) have also adopted a transactional approach (Trouwborst 45, Thoden van Velzen 44, Blok 9, Jongmans 30). All report fieldwork material using a social network approach, though even in this latest report of network studies based on empirical data most analyze material using network concepts retrospectively. Few had deliberately collected data in terms of network concepts in the field. Trouwborst (45) examines his material relating to "beer friends" and to clientage based on the receipt of cattle, and sets out to examine the "balance" in the investment of resources in the two different sorts of network. Blok (9) uses historical material to examine coalitions among Sicilian peasants. Thoden van Velzen (44), using an extended case study, examines a dispute in southwestern Tanzania in which the parties concerned mobilized support for their positions utilizing a number of different types of links with other significant protagonists in the events. Jongmans (30) examines a conflict over time in a Tunisian village and shows how the perception by the protagonists of their obligations to "serve" the others in the village had changed over the period involved. What is particularly interesting in Jongman's paper is that he presents, for the first time that I am aware

of, an examination in terms of “structural balance” (see 18) of the changes in perception of obligation. The information encompassing a period of 10 years is presented in considerable detail, which enables the reader to check the conclusions drawn—a procedure not often possible in accounts using the network approach. But it is significant that Jongmans was able to return to the field to check his findings *after* he had been alerted to the concepts relevant to this analysis.

NETWORK CONCEPTS

As more studies are published in which the notion of social networks is used, certain concepts seem to be more and more commonly accepted. The particular concepts which analysts find useful will of course depend upon the sort of problem they are trying to elucidate. Some features of social networks clearly will relate to some problems but not to others. In general, a major distinction refers to two very different aspects of linkages in social networks. These are the morphological as opposed to the interactional features of social networks (39, p. 12). The morphological features of a social network are those which deal with the shape or pattern of the links in a network. The earliest feature of networks isolated for theoretical use was a morphological characteristic. This was the notion of “connectedness” which Bott used to distinguish the characteristic of social networks of couples in relation to their sharing or not sharing domestic tasks (16, 17). In simplified terms, this notion relates to the extent to which people who all know one person also happen to know one another. When Bott made her analysis she used the term descriptively and did not operationalize the idea. Barnes (6) and Wolfe (53), however, suggest that the notion could be measured by the density of links among a set of points, and both suggest using a measure first used by Kephart in 1950, i.e. the ratio of actual existing links to the total number of possible links. So far, field workers have been able to present estimations of the densities of the networks they have studied, although the measures they have used have not always been calculated upon the same basis.

Measures of density obviously relate to a significant feature of social networks, but for analytical purposes the connection between the density of links and the behavior being studied needs always to be specified. For some purposes—for example, the reinforcement and standardization of norms in a set of people—a among the people of norms and of people’s attitudes towards those norms: it does high density only establishes the necessary conditions for the communication not establish sufficient conditions. If norms and the attitudes towards them are to be diffused among a set of people, the pattern of the linkages may be important (see for example 39, p. 18; 42, p. 47). The fact that links exist among people also does not imply that they will necessarily use these links to pass on certain types of information (4, 35). Another important point about density measures is made by Niemeijer (42), who points out that they vary directly with the mean number of members involved. This means that the same density measure will have a different meaning, depending on whether it relates to a small network or to a large network.

As yet we have seen very little data on measures of density in social networks, and where density measures have been presented, they sometimes differ in

meaning. This is due mainly to the discrepancy between a relatively sophisticated conceptual framework and inadequate data reporting. Cubitt (21, p. 76), for example, in one of the few papers dealing with density measures, uses the classical Kephart type measure for 35 networks in a Scottish town. In the same book, however, Boissevain (13, p. 138) follows the practice adopted by Kapferer (31, p. 226; 32, p. 172) of omitting from the measure all direct links of Ego with members in the network. Subsequently, Kapferer himself appears to use the Kephart measure (33, p. 109).

Cubitt's material, based on network sizes varying from 18 to 47, had densities varying from 8.6 to 22.5. These suggest a mean number of links of between 2.6 and 11.0 with a median of 6.0. This contrasts sharply with the two networks in Malta described by Boissevain (13, p. 125), one of which had 1752 members and the other 639. The Kephart densities of these networks were 23.8 and 5.7 respectively, which suggests a mean number of linkages of approximately 208 and 176 respectively. Part of the difference is undoubtedly due to the different ways in which data relating to the linkages in the network were collected, but the contrast is also due partly to the differing nature of social relationships in Malta and in Scotland.

A problem relating to the morphological characteristics of social networks relates to clustering. In the sort of data likely to be generated in anthropological studies, cliques, in the sense of sets of people all of whom know one another, may be too restricted a category for a useful analysis of behavior. It is for this reason that Barnes introduced the notion of cluster, that is, a set of persons whose links with one another are comparatively dense, without necessarily constituting a clique in the strict sense (6, p. 64). Clusters in a social network are obviously indeterminate phenomena in that they cannot possess clear-cut boundaries which would allow the analyst to distinguish them unequivocally. Barnes, therefore, proposed an arbitrary procedure of fixing a lower limit of at least five members and a density of 80 percent. Recently Niemeijer has taken up this problem and has shown that because of the effect of size on density measures, if the procedures for cluster membership proposed by Barnes are adhered to, there is an increasing impediment to inclusion in a cluster as the size of the cluster increases (42, p. 54).

Niemeijer redefines the notion of a cluster in terms of the number of links people have inside and outside the cluster and uses this definition to generate an algorithm which rearranges the rows and columns of a matrix of network links so as to bring out the clustering of individuals in the network. One of the advantages of the procedure is that it enables ordinal measures of, say, intensity of relationships to be taken into account when determining clusters (42, pp. 62-64).

Niemeijer then picks up the significance of intercluster links and argues that for analytical purposes they may be of considerable importance. He writes:

If there are only a few cross-linking relations and if it is also important for persons to reach into the other segment, one may expect the operation of brokers. One could also hypothesize that leaders will find it more difficult to organize supporters in other segments than their own when confronted with an important boundary (42, p. 51).

In the same book Kapferer (33, pp. 81-110) in fact makes effective use of what he calls cross-linkage, which is what Niemeijer calls "boundary density," to argue

that joint or complementary role relationships among spouses are more likely to occur where there is a high clusterability of the networks of husband and wife considered separately, but where there are few cross-linkages among the separate clusters in both husband's and wife's networks.

The notion of the compartment of a network introduced by Thoden van Velzen (44, p. 225) is related to the notion of a cluster. He defines a compartment in the same way as Niemeijer defines a cluster. In fact, it is clear from the way in which Thoden van Velzen uses the notion that a compartment is based on a cluster within a partial network. By this I mean that two conditions must be fulfilled for the compartment to be identified. The first is that the set of relationships must in fact constitute a cluster. The second is that the relationship must be based upon some identifiable feature of social relationships. Thoden van Velzen, for example, in his analysis of the power struggle going on in a Tanzanian rural area, distinguishes two pairs of compartments. One is based on ethnic identification comprising one cluster of people with affiliations with the Ndali and another of those affiliated to the Nyiha. A second pair of compartments is based on religious affiliations, one based upon Christianity and another on paganism. Thoden van Velzen came to this conclusion:

The exchange and communication scheme which exists in a community like the Itumba exhibits the following important characteristics:

- (a) The span of a person's network tends to be restricted by the boundaries of a compartment.
- (b) Multiple relations will grow and develop between persons within the same compartment rather than with persons outside these compartments (44, pp. 226–27).

The dangers of tautological reasoning are apparent here since if a compartment is defined in terms of the density of relationships within as against outside the compartments, we must expect the span to be limited by its boundaries. The proposition about multiplexity implies that the observer has defined the compartment in terms of one strand of the relationships linking people in it and that over time other strands will build themselves upon this initial strand. This is an interesting proposition which could be settled by empirical study.

Other morphological characteristics of social networks which most analysts of social data will need to take into consideration are: anchorage, the point of reference of a social network; reachability, the number of links that intervene between some originating person and some target person and range; and the number of persons with which a member of a network has links. I have discussed some of these points elsewhere (39, pp. 12–17; see also 8). Recently Kapferer (32, pp. 169–71) has emphasized the significance of an aspect of range which he calls span. He defines span as the ratio of both the direct links an individual has with members of a network and the links these members have among themselves to the total number of links among the complete set of people involved in the network. For Kapferer the importance of span lies in the extent it reflects the ease with which any particular person in the network is able to reach a sizeable proportion of the others in the network for any purpose he may have in mind.

Barnes (6) has drawn attention to somewhat different morphological characteristics of social networks. He distinguishes between stars and zones. Stars are composed of the links originating at any selected person in a network with others in that network. The links may be direct, thus constituting a primary or first order star, or indirect through others, thus constituting a second, third, or higher order star. Zones are the stars together with the links among the persons in a star of any order. Zones similarly may be designated as first order, second order, and so on. These terms provide a convenient way of identifying the parts of social networks which may be relevant in analyzing behavior.

Previously I identified content, directedness, durability, intensity, and frequency as the salient interactional criteria of social networks which had to be considered in the analysis of social networks (39, pp. 20-27). Some of these criteria had been identified by Wolfe (53) independently. There is no point in recapitulating the observations I have made concerning these concepts. Instead I confine comments to developments and extensions of these ideas.

Epstein (22) makes a distinction between the effective network and the extended network on the criterion of "connectedness." The effective part of the network of Chanda, the person who was the center of the study in which Epstein developed this notion, was more closely knit than the part of the network he called "extended." But it is clear from the way in which Epstein presents his data that he is in fact combining interactional and morphological features in distinguishing the effective from the extended parts of the network because he speaks not only of the extent to which people know one another but also of the intensity of the relationships (which confusingly he calls density). He identifies high connectedness and high intensity with the effective zone of the personal network and low connectedness and weak intensity with the extended zone of Chanda's personal network. Certainly Epstein in reporting his material finds it necessary to elaborate his notion to account for the fact that some people in the effective network do not in fact know one another. He writes: "the effective network then consists of clusters of persons fairly closely knitted together. The limits of such clusters . . . are vague, but in some situations they show an exclusiveness so marked as to suggest the existence of groups in the strict sense and point to recognizable divisions within the community" (22, p. 111). Clearly then the relationship between connectedness on the one hand and frequency and intensity of interaction on the other is not straightforward and requires further study.

Boissevain's (10, pp. 546-47) distinction between the intimate, effective, and extended zones of the network relies upon interactional criteria alone. The intimate zone is composed of those persons with whom the person upon whom the network is anchored is on closest terms. The effective network is composed of those people with whom the anchor person of the network is on less intimate terms and, importantly, in my opinion, from whom he can expect less than from the members of the more intimate network. The extended network consists of those persons whom the anchor person does not know personally but whom he could contact if he wanted to. In other words, Boissevain partitions the primary zone into an intimate and an effective section according to "intensity," that is, in terms of the

extent to which the persons involved would feel constrained to meet the demands that the anchor person could make of them. The people in the extended network are in the second or higher order stars of the anchor person in the network.

Intuitively it seems useful to identify these three “zones” of a social network. So far they do not seem to have been used much in the analysis of field material, which is ultimately the real test of the utility of concepts. The purpose of distinguishing these zones presumably would be to explain the behavior of people in different social situations. But in doing this we must once again be on our guard against the danger of tautology. The criterion upon which the intimate zone is distinguished from the effective is an interactional one—the extent to which obligations will or will not be honored. Quite clearly then we cannot use the distinction between the intimate and the effective zone to explain the extent to which obligations are honored. No doubt it is this difficulty that lies behind Whitten & Wolfe’s (52) misgivings about the criteria for determining the three zones.

Of all interactional aspects of network analyses, if not of network analysis in general, that relating to the notion of content seems to involve the most difficult problems and is correspondingly least well developed. Quite clearly any statement we may wish to make about the morphological features of a social network must be premised upon what links constituting the framework of the network are assumed to be. A network diagram purporting to represent the set of linkages in some social situation has an immediate visual appeal and can be used to convey a statement about the social relationships eloquently and succinctly. But before the diagram gets to the paper the fieldworker must have decided to represent some abstract property of the social relationships by lines linking points representing persons. There is the distinct risk here that the diagram may take on greater reality than it really merits.

What is involved here is the way in which the full complexity of human relationships may be so abstracted and simplified as to be capable of being represented as a network diagram. Which aspect of the relationship the observer chooses to represent in his diagram (or as entries in a matrix, which amounts to the same thing) will obviously turn upon the purpose the observer has in mind. I have previously distinguished three categories of content of social interaction (41). The first is a communication content in which the links connecting points representing persons in a network diagram represent the passage of information of some sort. The classical examples are studies of the diffusion of ideas, techniques, rumors, or information of some specific kind. Lee’s (35) study of how American women secured an abortionist is a good example. Anthropological analysts, however, are likely to involve more than simply the pattern of the flow of information among a set of specified people. When Epstein (23) looked at the flow of gossip through a social network in an African township, his purpose was not merely to trace the origin and flow of the rumor but also to examine the set of norms in terms of which those involved transmitted the gossip. Those concerned in the gossip net all occupied elite positions in the social system of the township, and the way in which

the events around which the gossip centered were interpreted served to reinforce the status position of the gossipers themselves.

Influence may be treated as a type of communication content in this context. Wheeldon's (46) study of the way in which a leader in a Eurafican suburb of an African town brings pressure to bear upon a number of his rivals to undermine their opposition to his power is a good example of the way in which influence is transmitted along network links. Of special interest in Wheeldon's analysis is how few steps in the network the anchor person needs to use to bring pressure to bear upon his rivals. He could not confront his rivals directly on an issue which was both embarrassing and likely to involve a good deal of feeling. The community was small and fragile: violent interpersonal tensions could not be sustained in it for long. But the anchor person could bring pressures to bear on each of his rivals through an intermediary in three steps at the most. Another point of special interest in Wheeldon's analyses is the extent to which the anchor person uses multistranded relationships in order to bring pressure to bear on his rivals, for he finds that pressures so transmitted turn out in the end to be most effective. This finding from Wheeldon's analysis poses a number of intriguing questions about the relationship between interactional features of social networks as, for example, that between intensity and multiplexity.

The second category of content of the linkages in social networks is that of transaction or exchange (cf Whitten & Wolfe 52). In analyses of this sort the observer represents various transactions or exchanges between people as links in a social network. As before these links may be conceptualized as single or multi-stranded, and interesting propositions may be built up about the way in which the behavior of actors in some situation may be constrained by the transactional relationship in which they have become involved.

Whitten & Wolfe (52) distinguish what they call "action theory" from "exchange theory" in the way in which social networks have been used. There is some point to this distinction. Both exchange theory and action theory, insofar as they manifest themselves in analyses using social networks, are transactional approaches. Action theory, as Whitten and Wolfe describe it, involves studying "the interpersonal, maximizing exchanges that take place between individuals linked to one another in effective personal networks owing to their common relationship to a *socially significant ego*. The more the socially significant ego maneuvers for social position, the more important becomes an analysis of his exchanges and their ramifying consequences on individuals caught up in his maneuvers (52). Action theory by this account is a type of exchange theory, though possibly not of a sophisticated and developed kind such as Blau's. It might be useful then to use action theory for general analyses based on exchanges as transactions and exchange theory for more specific theories involving exchange such as Blau's.

One of the earliest to use transactional analysis in combination with social networks was Adrian Mayer (37), whose notion of action-sets—sets of people mobilized by some anchor person in a network to provide some service for him—has proved to be of considerable use to subsequent network analysts, e. g.

Boswell (15), Harries-Jones (27), Thoden van Velzen (44), and Trouwborst (45). Adrian Mayer associated the notion of action set with the concept of the quasi-group. A quasi-group may be looked upon as a proto-group in the sense of a set of people who have acted corporately on several occasions and who if they do so on future occasions may develop an internal arrangement of activities, or a structure of relationships may become a corporate group. Boissevain (10) has postulated a continuum ranging from social networks at one extreme through action-sets, quasi-groups, and corporate group to "societies" at the other. The action-set in this formulation would be a subset of the links which constitute a social network—the links between a set of actors and some central person which that person activates for some transitory though specific purpose. The action-set that Mayer studied was comprised of the supporters for a candidate in a municipal election. A quasi-group would consist of members of successive action-sets mobilized by some anchor person for a series of different purposes. The notion of quasi-groups has been criticized by Harries-Jones (27) and Boissevain (11). The basis for this criticism is that the criteria which are essential to define a quasi-group are already contained in the ideas of personal network and action-set and that nothing is added to our understanding of social behavior by identifying the quasi-group. There is, of course, some substance to the criticism. Harries-Jones points out that the distinction between the action-set and the personal network is only one of abstraction—certain links in the personal network are considered in isolation from others because they provide the basis upon which the anchor person mobilizes support and action for his purpose. The personal network, Harries-Jones argues, is the empirical reality: the action-set is the analysis abstracted from it. The quasi-group, on the other hand, differs from the action-set only in that the members of an action-set act together over different issues on separate occasions. Nothing more than this is added to our understanding of the behavior by the notion of the quasi-group. My own feeling is that just as the action-set may be looked upon as an abstraction from the links constituting the personal network, the quasi-group in turn may be looked upon as a property of the network links which is emergent from the interaction. In specific terms, the property which it exhibits is in fact the beginning of a division of labor in activities and the emergence of structured roles within the action-set.

The utility of these concepts will, of course, be demonstrated by the extent to which subsequent fieldworkers, employing interactional material, will be able to gain insight into it and deepen their understanding by using these notions. At present the position seems to be that analysts making use of the network approach are able to use action-set and quasi-group mainly through their reliance upon propositions deriving from transactional and exchange theories.

The third category of content which network analysts appear to have distinguished is what I refer to as the normative content. The normative content of network linkages refers to the actor's construction of the meaning of that relationship to him in terms of his understanding of the other person's expectation of his behavior. For example, in a partial network the designation of a link as a

kinship link, or one based on neighborliness or membership in a political group, in my opinion is this sort of classification of network links. Perhaps most analyses made in terms of social networks are of this type, although often not with much formal consideration for the implications of the assumptions underlying the subsequent deduction made from the material. The approach to network analysis from this point of view provides an extension to, and development of, the classical structural-functional approach to anthropology. The starting point of the analysis must of necessity be similar to that from which structural analyses have been conducted in the past, that is, from the observer's assessment of the meanings which actors are attributing to cues and symbols in social interaction. Where network analysis differs from structural analysis when the normative content of the links in social interaction is selected as the focus of attention, however, seems to be mainly in the level of abstraction at which the analyst works.

DATA COLLECTION

I had observed earlier (39, p. 30) that if field workers are to record data systematically enough and in sufficient detail to enable analyses to be made in terms of the concepts and notions which have developed in connection with social networks, then a level of intensity and range of competence will be demanded of them that very few will be able to achieve.

Some notions of what is involved may be gauged from Wolfe's (53) scheme to record systematically the variables needed for a network analysis. Wolfe identifies 12 variables which need to be measured and sets out a procedure for doing this. Aronson comments, not without good reason, about Wolfe's scheme: "some of his readers will be terror-stricken by the amount of labor that must be carried out before the machines can aid in analysis and comparison" (2, p. 223). Perhaps not surprisingly, the method so far has been applied only to novels or accounts which have already been published but which were not based on the network approach. In fact, many of the reports of network analyses do not go beyond a normal detailed description of a social situation using network terminology rather than, say, structural-functional terminology. At present it seems that no alternative to data collecting based upon participant observation has been devised that is suitable for testing proportions derived from network notions. Recent examples of the detail and intensity demanded for effective network analyses are provided by Kapferer (31, 33), Jongmans (30), and Boissevain (13). In general the use of questionnaires to collect information in relation to social networks on a large scale seems to have been only partially successful, and they have been confined to studies by sociologists (see for example 34). But Boissevain (13) used a questionnaire approach by asking two anchor persons to complete details about the people they knew and the relationships they had with them. Both anchor persons were teachers. One listed 1751 persons and the other 638, so the amount of work required to collect enough information to make a network analysis possible was considerable. Boissevain, of course, had done extensive participant observation in

the field before selecting the anchor persons to use in his study and before framing his questionnaire. The responses of the anchor persons were then discussed with them and expanded where necessary.

A procedure I had not appreciated before but which has been reported as successful is the use of diaries in which the anchor persons record people with whom they have interacted in some previous time period. Cubitt (21), for example, used a combination of interviews, participant observation, and what she calls the keeping of a "structured diary" by the anchor person for a week.

Jongmans and Kapferer seem to have used more conventional procedures of systematically recording the actions and interactions of the persons considered to be included in the social network they were studying. Cubitt and Boissevain were working with literate people, whereas the people with whom Jongmans and Kapferer were working were less at home with writing down and recording their own actions.

My own view is that the analytical determination of the content of the network linkage is so crucial for the sort of network analysis that is usually attempted that some involvement of the observer with the people he is studying is essential. This is because the determination of the content involves knowing what meaning the actors in any situation are attributing to the cues, signs, and symbols being presented in the interaction. Until the observer is reasonably confident that he is able to identify these from any questionnaire or interview response he is likely to obtain in a network study, then the use of more formal means of collecting data will of necessity have to be delayed.

Whitten (49, 50), who has used network concepts in much of his research, raises the important problem of the way in which the success of a participant observer fieldworker can be affected by the nature of existing social networks among the people he is studying. His contrasting experiences among Negroes in Ecuador in which people used network links to exploit economic and political opportunities open to them, and among Negroes in Nova Scotia where people used network links to prevent others from gaining access to economic and political privileges meant that he had to adopt somewhat different fieldwork strategies in the two studies. In a sense the potential participant observer wishing to make a network study is faced with the paradox that he is best placed to initiate the study after he has completed it.

THE ANALYSIS OF SOCIAL NETWORKS

Once the requisite data have been collected, the analyst is confronted with the problem of uncovering the regularities in his material. The possibility of using some of the propositions deriving from mathematical graph theory and procedures devised from them which I had noted earlier unfortunately still remains a possibility which has not yet been realized (see also Barnes 7). Notable is Niemeijer's work in Holland carried on in association with fieldworkers such as Boissevain (13) and Jongmans (30). Recently Gleason (24) has prepared a system of two PL/I computer programs which enables a relatively inexperienced com-

puter user to carry out a number of operations on directed graphs. At present these programs are not widely available, but their potential for the analysis of the material that has been collected in appropriate form is considerable. The logically prior problem, however, of making the "quantum leap" from anthropological concepts, which are not necessarily axiomatically arranged, to mathematical operation, which assumes this property, is still with us. This is in spite of the fact that the assumptions necessary in graph theory seem to be less demanding from the anthropological point of view than, say, the ordinary statistical procedures based on sampling that anthropologists often use without undue qualms.

It may well be that a different set of analytical procedures based on wider assumptions, using perhaps more abstract topological models than graph theory, is needed to handle the sort of problems that anthropological studies using social networks seem to involve. There is no doubt that these exist as, for example, by using simplicial complexes by which the multiplexity of the links of a social network may be represented (1). Another is in use of what is known in mathematics as functorial mapping, which the proponents of this procedure (36) maintain allows for the concatenation of effects through the network. So enthusiastic are the proponents of this method that they write: "Networks will probably become as important to sociology as Euclidean space and its generalizations are to physics" (36, p. 77).

Whether this claim is justified, no one at this stage can say, but it seems certain that if the steps are to be taken in this direction, the data concerning all the links in a social network relating to some event or series of events in which the analyst is interested will have to be recorded in greater detail and more systematically than has customarily been the practice.

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